

degree of LL.D. upon him in recognition of services he rendered to it, and he was also a Fellow of the Royal Society of Edinburgh. After the death of his father, in 1864, he lived with his mother at Felbridge, until she died in 1876, and subsequently his life became akin to that of a recluse and almost a hermit. Like his father he was most munificent in his contributions to anything and everything for the public benefit or advantage. The present Felbridge Church was built by the elder Mr. Gatty, and possesses the remarkable peculiarity of standing in the two Surrey parishes of Godstone and Tandridge, within a quarter of a mile of the Sussex border. Dr. Gatty was chairman of the East Grinstead bench of magistrates in Sussex, and for years attended the bench at Godstone, in Surrey, of which county he was also a justice of the peace. He had no near relations and very few intimate friends, leading, as has been said, the life of a recluse and shutting himself up with his fine and valuable library and instruments. He possessed an elaborate and probably almost unique orrery.

He was elected a Fellow of the Society on the 13th of May 1870, and was at one time a regular attendant at our meetings, but never contributed any paper. His scientific interests were largely divided between astronomy and botany. He died at Felbridge on the 12th of December 1903.

W. N.

JAMES GLAISHER, although in early life attached to astronomical pursuits, will be hereafter remembered principally as a meteorologist, not only as having for so many years held the position of Superintendent of the Magnetical and Meteorological Department at the Royal Observatory, Greenwich, but also, in a great degree, on account of his independent work in many directions in the cause of meteorological science. A pioneer in meteorology, he very early turned his attention to the organisation of the many amateur meteorological observers dispersed throughout the country, who, hitherto working in an isolated manner, and too often with inferior instruments, became by his vigorous action federated, as it were, into a system having a common object, thus making it possible, with improved instruments and methods, to produce a reliable body of information on the meteorology of the country—an early type of the more extended international systems that became in after years established. He was also largely instrumental in founding the British Meteorological Society, now known as the Royal Meteorological Society, in the early years of which it was by his own personal exertions that the Society was placed on that secure and stable footing the fruits of which the existing Society now enjoys.

It may be convenient, in the first instance, to speak of his astronomical work. Born on the 7th of April 1809 at Rotherhithe, London, Mr. Glaisher was first heard of as receiving

instruction in the use of astronomical instruments at the Royal Observatory, Greenwich, in the year 1829, in which year he was appointed an assistant upon the Grand Triangulation of the Ordnance Survey of Ireland. He was engaged upon this work, in which he took the keenest interest, for two years, but was then disabled by a very serious illness, brought on by exposure on the mountains; and was obliged to leave the Survey in consequence. On his recovery he became an assistant at the Cambridge Observatory, then under the direction of Professor Airy. A large mural circle, provided for this Observatory, having been mounted in October 1832, and divided on its own pier by Mr. Simms in November, Mr. Glaisher commenced work with this instrument on the 9th of January 1833, the observations during this and the two following years being nearly entirely made by him. A fine series of equatorial observations of Halley's Comet, extending from the 2nd of September 1835 to the 16th of January 1836, was also his work. After the then Professor Airy had taken up the position of Astronomer Royal at Greenwich Mr. Glaisher, who had meanwhile been appointed assistant at Greenwich, was allowed leave of absence to remain for a time at Cambridge, entrusted in a great degree with the task of clearing up the 1835 work. He joined the staff of assistants at Greenwich about the middle of the month of February 1836. Since the year 1834 Mr. Glaisher had been employed, first at Cambridge and afterwards for a time at Greenwich, on the "Reduction of the Greenwich Observations of Planets from 1750 to 1830," but for this work a special staff of computers at Greenwich was soon afterwards formed. He became further employed on the reduction of the Cambridge observations of the Sun, Moon, and planets, and also in the collection of the Cambridge annual results of star places for the formation of the Cambridge Catalogue of 726 stars, reduced to the 1st of January 1830. The Rev. R. Main, then First Assistant at Greenwich, having commenced an investigation into the correction of the elements of the orbit of the planet *Venus*, employing the Cambridge observations of 1833 to 1835 and the Greenwich observations of 1836, had written two papers thereon, but not having time to pursue the subject this work was continued by Mr. Glaisher in two further papers, extending the investigation to include also the Greenwich observations of 1837 to 1839. These papers, under the title "Continuation of the Investigation for the Correction of the Elements of the Orbit of *Venus*," were read before the Royal Astronomical Society on the 12th of June 1840 and the 12th of March 1841 respectively. In April 1858 he communicated to the Society a paper on the observation of the annular solar eclipse of the 14th-15th of March of that year, made near Oundle, Northamptonshire, including observations by other observers; and at the meeting of April 1863 one on "Lines in the Solar Spectrum as observed in the Balloon Ascent of the 31st of March." And at the meeting of

December 1865 he gave an account of "The November Meteoric Shower" of that year, when a considerable number of meteors were seen, but the celebrated display occurred in the following year, 1866.

The Astronomer Royal, in his report to the Board of Visitors in 1836, referred to the proposed construction of a magnetic observatory at Greenwich, and the building was erected at the beginning of the year 1838. The instrumental equipment was sufficiently advanced to allow observations of magnetic declination to be made on one day in each of the months of February, May, August, and November of the years 1839 and 1840 at each fifth minute throughout the twenty-four hours. But in the latter part of the year 1840 the magnetical and meteorological observatory became fully constituted, the Astronomer Royal giving the position of superintendent to Mr. Glaisher, who at once applied himself energetically to the duties of his new post. The first intention had been to carry on the observatory for three years, a period that was afterwards extended to five years, as for the various colonial observatories at that time temporarily established. Finally the observatory was made permanent. Observations of the magnetical and meteorological instruments were made at intervals of two hours, day and night, unless abnormal change or movement was remarked, when extra eye observations, involving much labour, were taken. On the 25th of September 1841 there occurred a remarkable magnetic storm, which, well observed, revealed a new class of magnetic phenomena. An account of this storm being printed and circulated, it was found that at such distant places as Toronto, Trevandrum, and the Cape of Good Hope disturbances of similar character had occurred on the same day, appearing also to have commenced at Toronto "nearly at the same absolute time as at Greenwich." Again on the 24th of September 1847 there occurred another very remarkable magnetic storm, also well observed, "to which there had been nothing comparable before." But from the year 1848 the labour of taking at such times long series of eye observations became unnecessary, since the variations of the principal magnetic and meteorological instruments were afterwards recorded by photography, on a plan arranged by Mr. Charles Brooke, the continuous registration thus obtained giving an insight into the character of the instrumental changes, especially those of the magnets, that has been of the greatest value. It became thus possible to diminish the number of eye observations and avoid so much work at night.

As soon as the duties of his new position permitted Mr. Glaisher undertook an important investigation, that of the question of radiation from the earth at night, and with the assistance of the members of his staff he carried out an extensive series of observations on this interesting branch of meteorological research, employing for the purpose a large number of specially constructed, accurate and very sensitive thermometers, having their scales

engraved on the tube. The observations extended from September 1843 to May 1844. They were very numerous, and the results were incorporated in a paper "On the Amount of the Radiation of Heat at Night from the Earth, and from Various Bodies placed on or near the Surface of the Earth," communicated to, and read before, the Royal Society on the 4th of February 1847. In the course of these experiments he frequently passed the night in the open air, watching for the formation of the dew, and lying on the damp grass. This produced a severe attack of rheumatism, from which he did not recover for several years.

In another paper Mr. Glaisher collected the two-hourly meteorological observations of the barometer and thermometer made at Greenwich during the five years ending 1845, employing them to form, for each month of the year, corrections applicable to observations taken at any hour to obtain mean values, for pressure of the atmosphere, temperature of the air, and the various meteorological elements depending thereon. As regards temperature of the air, corrections obtained from this paper were employed to reduce to mean values the observations of temperature made at the apartments of the Royal Society. The results were contained in two papers, the second of which gave monthly temperatures of the air reduced to Greenwich, from 1771 to 1849, in all of which years, excepting from 1781 to 1786 and from 1844 to 1849, the results depended on the Royal Society records. The three papers here described were communicated to the Royal Society in the years 1848, 1849, and 1850 respectively.

For many years Mr. Glaisher communicated to the Registrar-General of Marriages, Births, and Deaths a quarterly report on the meteorology of the kingdom. This work had an origin in part accidental. Mr. Glaisher, having remarked that the Registrar-General had published the mean temperature of York as being five degrees higher than that of London, wrote to point out to him that this was a physical impossibility, when it appeared that there was no person in the office of the Registrar-General who understood matters of the kind. Mr. Glaisher, in his endeavour to bring into general use instruments of more perfect character than had been hitherto used, was at this time in correspondence with a large number of observers, and persuaded them to report their observations regularly to him, which, reduced on a uniform plan, formed the basis of the report which he commenced about the year 1846 (the writer of this being at that time one of the contributors) to supply quarterly to the Registrar-General with his own special "Remarks on the Weather during the Quarter." His hygrometrical tables, adapted to the use of the dry and wet bulb thermometer, published in 1847, have proved of great service to meteorologists. Many successive editions of these tables have been published, and they have been incorporated in foreign collections of meteorological tables.

The increasing attention that became paid to meteorological science suggested the desirability of forming a society which

should bring into closer union the meteorological workers of our country, by affording them means for the publication of meteorological observations and results, or papers of general meteorological interest, and in the year 1850 Mr. Glaisher, in conjunction with a few others similarly interested, founded the British Meteorological Society, afterwards known as the Meteorological Society, and later as the Royal Meteorological Society. He further undertook the post (so important in a new society) of secretary, a position which he occupied for some twenty years, with the result that, at the time of retiring therefrom, the society had become well established.

At the Great Exhibition of 1851 Mr. Glaisher was appointed Reporter to the Section of Philosophical Instruments, Class X., and produced an able and comprehensive report. Of astronomical instruments there was apparently not a large collection, but one was an interesting exhibit, the historical Westbury Circle made by Troughton at the beginning of the last century for Mr. Pond, afterwards Astronomer Royal. The two circles; it may be remarked, took nearly twelve weeks to graduate, working each week day on an average of eight hours daily, an operation at the present day a question of hours only. Of thermometers only Mr. Simms and Messrs. Negretti and Zambra in the British portion of the exhibition showed instruments graduated on the stem.

The following detached sentences extracted from a lecture given by Mr. Glaisher at the Society of Arts in 1852 (one of a series of lectures on the Great Exhibition) well show what had been the condition of matters, and the efforts that he was making to improve meteorological instruments and methods :—

“The collection of meteorological instruments in the exhibition would lead us to the conclusion that the conditions of good instruments are better understood and fulfilled by makers abroad than at home. That this will speedily cease to be the case I feel assured. . . . That the want of good instruments is experienced I can myself testify. For years I have pursued the subject of meteorology, and have long been convinced that a widely spread and universal system of simultaneous observation, uniformly reduced, must be the groundwork of its establishment as a science. For the sake of this I six years ago reduced my system to practice, and introducing it first among the meteorological observers, contributors to the reports of the Registrar-General, in a short time perceived with satisfaction some of the good results. . . . I have been gradually increasing the number of observers, and have now established upwards of fifty meteorological stations in different parts of the country, all of which contribute observations made and reduced upon my system. . . . I now come to that which had nearly caused the subversion of my scheme, the difficulty of obtaining good instruments at a fair and moderate price. . . . That I have been enabled to do. . . . All the barometers, and the greater part of the thermometers,

scattered among the observers have been made under my direction by him [Mr. Barrow], and constitute, with few exceptions, the most efficient instruments at their command."

In a paper by Mr. Glaisher "On the Severe Weather at the Beginning of the Year 1855, and on Snow and Snow Crystals," published in the *Proceedings of the British Meteorological Society*, he states that the primary figure or base of each crystal appeared to be "a star of six radii, or a hexagon of laminae, and the compound varieties to include combinations of spiculæ, prisms, cubes, and rhomboids, aggregated upon and around the central figure." There are detailed descriptions of many of the forms of crystals, and also appended are 151 pictures of the different varieties of crystals, from drawings by Mrs. Glaisher based on his sketches. A further paper "On the Meteorological and Physical Effects of the Solar [Annular] Eclipse of the 15th of March 1858" contains meteorological observations made at very frequent intervals during the eclipse, at twenty-nine different stations, with remarks on the effects produced on birds and animals.

Papers on meteorological subjects become henceforward very numerous, amongst which may be found reports on meteorology, including one in relation to the health of the troops in India, discussions of collected observations of meteorological elements, as well as communications on special atmospheric phenomena. In one paper "On the Secular Increase of Mean Temperature" (*Proceedings of the British Meteorological Society*, 1865) Mr. Glaisher concluded from comparison with earlier records, instrumental and otherwise, that our climate during the preceding 100 years had altered, that the temperature of the year was 2° warmer, the winter months all much warmer, and every month of the year somewhat warmer than before. But the last sixty years show no definite change, and it might be desirable to rediscuss the older observations.

Another considerable and important work has yet to be spoken of. the balloon ascents undertaken for scientific purposes. A committee of the British Association having been appointed to consider the question of making observations in the higher strata of the atmosphere, after some preliminary trials with an insufficient balloon, Mr. Glaisher himself undertook to make the necessary ascents, with the aid of the aeronaut Mr. Henry Coxwell, in a large balloon made by the latter at his own cost for this special purpose. The observations proposed to be made were those of atmospheric pressure, temperature, and the hygrometric state of the atmosphere, the height and motions of clouds, and other phenomena. The first ascent was made on the 17th of July 1862, and the last on the 26th of May 1866, in all twenty-eight, some of them in the evening. On five occasions an altitude of between 10,000 and 20,000 feet was reached; on five occasions also an altitude of between 20,000 and 30,000 feet; and on one occasion (the 5th of September 1862) an altitude of 37,300 feet is said to have been reached, a pheno-

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menal height, the experiences and sensations of the voyagers at which altitude are narrated in the article on "Aeronautics" in the *Encyclopædia Britannica*. It appeared as one of the results of the experiments that the rate of decrease of temperature with elevation near the earth was very different when the sky was clear from that when it was cloudy, and the equality of temperature at sunset and increase with height after sunset were remarkable facts that were not anticipated. Complete accounts of the observations made in these ascents are to be found in the volumes of the *British Association Reports* between the years 1862 and 1866. Other ascents were afterwards made at Chelsea in a captive balloon on the offer of the owner, M. Giffard, for the purpose of making further observations at low altitudes.

Mr. Glaisher retired from his position at the Royal Observatory at the end of the year 1874, but he continued to lead an active life, still communicating to the Registrar-General his quarterly weather report, one of his early organisations, which indeed he continued to supply until 1901—that is, altogether for a period of some fifty-five years. He took great interest in the Palestine Exploration work, and was chairman of the Executive Committee from 1880 almost up to the time of his death. He discussed observations of atmospheric pressure, temperature, wind, rain, and cloud at points in Palestine in fifteen papers communicated between the years 1891 and 1902 to the publications of the Palestine Exploration Fund.

Another important work that occupied a considerable part of the leisure time of Mr. Glaisher was the calculation of certain factor tables. The Committee of the British Association on Mathematical Tables, of which both Mr. Glaisher and his son Dr. J. W. L. Glaisher were members, in considering the question of factor tables, found that although Burckhardt had calculated tables giving the least factor of all numbers not divisible by 2, 3, or 5 for the first, second, and third millions, and for a small part of the fourth million, and that Dase and Rosenberg had calculated similar factors for the seventh, eighth, and ninth millions, there thus remained three intermediate millions for which factors were yet required. Crelle, previous to 1850, had presented to the Berlin Academy the manuscript of factor tables for the intervening fourth, fifth, and sixth millions, but on inquiry being afterwards made as to whether there were any chance of publication of the manuscript, the Secretary of the Physical and Mathematical Section of the Academy reported that the manuscript had been examined on a former occasion and found to be so inaccurate that "the Academy was convinced that the publication would never be advisable." The Committee of the British Association, considering, however, that the completion of the factor tables for these three millions was a matter of great importance, made a grant of 250*l.* towards the cost of doing the work, which, being one that required careful supervision,

was undertaken by Mr. Glaisher with the assistance of two computers, the results for these fourth, fifth, and sixth millions, with an explanatory introduction by Mr. Glaisher, being published (by Taylor and Francis) in three separate quarto volumes.

Mr. Glaisher was elected a Fellow of the Royal Society in the year 1849, and previously, in the year 1841, had been elected a Fellow of the Royal Astronomical Society, and at the time of his death was its oldest Fellow. Of the Royal Meteorological Society he was, as before mentioned, mainly its founder. He was connected also with many other scientific societies—the Royal Microscopical (of which he was President in 1865–68), the Photographic (of which he was President for the twenty-three years 1869–92), and others—and he served on various British Association Committees, being for many years a member of that on Luminous Meteors. In various industrial undertakings he took a lively interest to the end of his life. After his retirement from the Royal Observatory he continued to reside for a number of years at Blackheath, but eventually he removed to Croydon, where after a very active life he died at “The Shola,” on the 7th of February 1903, in the 94th year of his age. He was buried at Shirley, near Croydon.

W. E.

WILLIAM HARNETT was born at Tralee, co. Kerry, on the 26th of March 1830. He was educated at Oscott College, Warwickshire, and was for some time a corn broker in Liverpool.

Several years ago he retired from business and went to live at Wimbledon. He died on the 2nd of January 1903, leaving a widow, one son, and three daughters.

Mr. Harnett had long been interested in astronomy, though he only recently became a Fellow of the Society, being elected on the 11th of January 1895.

W. AMBROSE KIBBLER was born in 1848 at Hackney, where his father long practised as a doctor. The son was a student at the London Hospital, where he afterwards held for a short time the posts of house surgeon and house physician. In 1876 he took the degree of M.B. at Marshall College, Aberdeen. He joined his father at Hackney and continued to practise there till the end of his life. During the last few years Dr. Kibbler experimented with X-rays in cases of cancer. Though no permanent cure was effected he was able to alleviate suffering to some extent by this treatment.

Besides being a skilful physician Dr. Kibbler was an artist of considerable merit. He was a member of the Langham Sketching Club, and had several pictures hung at the Institute of British Artists. For many years he was an enthusiastic astronomical observer. About eighteen years ago he commenced observations of the Moon with a $9\frac{1}{4}$ -inch reflector. Some trouble with his eyes obliged him to discontinue this work

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